PEACE/WILLISTON
FISH & WILDLIFE
COMPENSATION
PROGRAM

BC hydro

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A Reconnaissance Survey of Curve Lake

D. A. Jesson
1989

PWFWCP Report No. 88

The Peace/Williston Fish & Wildlife Compensation Program is a cooperative venture of BC Hydro and the provincial fish and wildlife management agencies, supported by funding from BC Hydro. The Program was established to enhance and protect fish and wildlife resources affected by the construction of the W.A.C. Bennett and Peace Canyon dams on the Peace River, and the subsequent creation of the Williston and Dinosaur Reservoirs.

Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave. 3rd Floor, Prince George B.C. V2L 3H9

Website: *www.bchydro.bc.ca/environment/initiatives/pwcp/*

This report has been approved by the Peace/Williston Fish and Wildlife Compensation Program Fish Technical Committee.

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Author(s): Duane A. Jesson[1]

Address(es): [1] Peace/Williston Fish and Wildlife Compensation Program, 1011 Fourth Ave., 3rd Floor Prince George, B.C. V2L 3H9

105-02717/

A RECONNAISSANCE SURVEY OF

CURVE LAKE

WATERSHED: PARSNIP RIVER

DATE OF SURVEY: JUNE 19. 20. 1989

FIELD CREW LEADER: D. A. JESSON

FIELD ASSISTANT: M. G. LABACH

REPORT PREPARED BY: D. A. JESSON

WILLISTON FISHERIES PROJECT

B. C. HYDRO

ENVIRONMENTAL RESOURCES

and

RECREATIONAL FISHERIES BRANCH

MINISTRY OF ENVIRONMENT

RELEASED BY: _____

D.H.G. Ableson, Regional Fisheries Biologist

LAKE: **CURVE** **SYSTEM NAME: UNNAMED C.**

A.S.A.P. REFERENCE NO. **SYSTEM NO.: 20-1700-110**

DATA ON FILE FOR THIS SURVEY

Location	x	Dissolved O2/Temp. Profile	x
Physical Data	x	Netting Record	x
Bench Mark	x	Lake Catch Summary	x
Terrain Features	x	Individual Fish Data	x
Access	x	Fish Preserved	-
Resorts and Campsites	x	Stomach Analysis	x
Other Developments	x	Scale Reading	x
Obstructions and Pollutions	x	Location of Inventory Sites	x
Special Restrictions	x	Photograph Directory	x
Aquatic Plants	x	Appendices:	
Wildlife Observations	x	A: Water Chemistry Analysis	x
Miscellaneous Comments	x	B: Tributary Stream Data	x
Lake Drainage	x	Bathymetric Map Reduction	x
Fisheries Management Comments	x	Bathymetric Map	x
History of Previous Surveys	x		
Water Chemistry Summary	x		

LOCATION

Location: 70 km NW of Mackenzie
Elevation: 808 m +/-
Latitude/Longitude: $55^{0}43'15"$:123°58'43" U.T.M.: 10.4385.61752
Management Unit: 7-29 N.T.S. Map No.: 930/12
Drainage: Outlet C --> Manson R. --> Williston L (Parsnip Reach) --> Peace R.

PHYSICAL DATA

Lake Drainage Area:	- km^2	Volume:	1,540,000 m^3
Water Surface Area:	501,000 m^2	Flushing Rate:	-
Area above 6 m contour:	397,000 m^2	Perimeter of Islands:	0 m
Shoreline Perimeter:	5,250 m	Number of Islands:	0
Maximum Depth:	8.3 m	Mean Depth:	3.1 m
Filterable Residue (TDS):	64 mg/l	Secchi Reading:	3.95 m

Sounding Device: Lowrance X-15 Elevation Source: Contour interpolation

BENCHMARK

(Iron spike, centre of red circle) located 2.0 m above present water level in a 55 cm diameter Lodgepole pine, on the east shore of the lake at the access point. The tree is 7.0 m from the water's edge.

High water mark: 0.20 m above water level at time of survey.

Lake: **CURVE**

TERRAIN FEATURES

Immediate Shoreline:

The lake is divided into two distinct basins (north and south).

North basin: The shoreline is gently sloped with a marsh perimeter around most of the basin. The only exception to this is the most southerly shore of the basin which has a moderate to moderately steep shoreline. Water depth is less than 1.5 m as a thick layer of silt (1.0 m) covers the entire bottom. Boating is difficult due to the shallowness of the water and the presence of Potamogeton sp., which occupies much of the surface area.

South basin: Shoreline drop-off both above and below the water line is mainly moderate with extremes ranging from gently sloped to moderately steep. The NW shore has banks that are slowly eroding. Overland access to shore is restricted to the access path on the east shore due to the complete forest cover. Some dead fall exists around the lake and may be a bother to boaters near shore. A brush border of alder fronts most of the shoreline. Shoreline substrate is largely a mixture of cobble, gravels and sand. Some boulders are present, especially in the outlet bay.

Surrounding Country:

Curve Lake is located within the sub-boreal spruce biogeoclimatic zone.

The lake is located between low rolling hills completely forested with a mature coniferous (spruce/pine) forest. Some logged patches in secondary succession are evident to the SW, approximately 1 km from the lake.

Curve Lake is located within a recreation reserve.

Lake: **CURVE**

ACCESS

Directions:

From the junction of Mackenzie Boulevard (Highway 39) and Centennial Drive in downtown Mackenzie, drive south on Highway 39 for 30 km. Turn right onto Highway 97 and travel 3.1 km to the junction of Finlay Forest Service Road and turn right again. Proceed 112.1 km on the Finlay FSR (crossing over the Nation and Manson Rivers) and turn right onto the access road to Curve Lake. The access road is marked by a sign indicating Curve Lake, however, it is not easily seen. Travel 0.15 km to the Forest Service recreation site on the east shore of the lake. There is a short (20 m) steep trail down to the lake. Total distance by vehicle from Mackenzie to Curve Lake is 145.35 km.

Road Type and Conditions:

Highways 39 and 97 are both paved and in good all-weather condition. Finlay FSR is an all-weather gravel logging road in fair to good condition. Some low-lying areas are soft and badly rutted.

The access road is a rough, single lane dirt road in need of brushing out.

Restrictions:

Caution must be used when travelling in the area as active logging occurs summer and winter.

RESORTS AND CAMPSITES

An undeveloped Forest Service recreation site is located on the east shore of the lake at the end of the access road.

OTHER DEVELOPMENTS

None noted.

Lake: **CURVE**

OBSTRUCTIONS AND POLLUTIONS

None noted.

SPECIAL RESTRICTIONS

Curve Lake is located within a recreation reserve as designated by Ministry of Forests.

AQUATIC PLANTS

Aquatic plants were abundant and dense throughout the north basin of the lake. In the south basin, plants were also abundant and widely distributed mainly along the shallows close to shore. The following species were identified in the field. None were collected.

Potamogeton sp.

Nuphar sp.

Equisetum fluviatile

WILDLIFE OBSERVATIONS

One bald eagle, one killdeer and two loons were sighted during the survey.

MISCELLANEOUS COMMENTS

Bathymetric map: The lake outline is from an enlargement of aerial photograph BC 7344 No. 206 flown July 21, 1971.

Seven large scale suckers were observed floating dead near the narrows joining the two basins.

Freshwater clams noted in shallows.

Lake: **CURVE**

LAKE DRAINAGE

General:

Three inlets enter the lake. The main inlet enters the northerly basin through a large marsh area. An inlet entering the west side of the southerly basin is intermittent, while a third inlet drains a low-lying area east of the lake. The outlet creek flows 8.5 km to Manson River.

Major Systems:

There are no major systems.

Minor Systems:

Unnamed C. - outlet

This creek drains south from the east side of the southerly basin of Curve Lake. At 75 m downstream of the lake this creek has a velocity of 0.6 m/sec and a water temperature of 16°C. The average wetted width is 5.0 m, the average depth 11.0 cm and the bed material is 80% gravels. The outlet probably accounts for the majority of salmonid spawning. Rearing habitat ranges from fair to good due to abundant cover from deadfall and instream grasses.

Unnamed C. - inlet #1

This inlet drains into the west side of the southern basin and was dry at time of survey. At 10 m upstream of the lake, the creek bed has a 7% gradient with a channel width of 1.6 m. Air photos indicate the creek drains a marshy pond approximately 140 m west of the southern basin.

Unnamed C. - inlet #2

This main inlet enters the northerly basin through a large marsh area. The inlet was not surveyed due to difficulty in gaining access to it by boat (shallow water and weeds). Air photo interpretation indicates there is no salmonid spawning habitat (zero gradient and likely organic ooze substrate).

Unnamed C. - inlet #3

This creek drains southwest into the northeast corner of the northerly basin. At 50 m upstream of the lake this creek has a velocity of 0 m/sec (0% gradient) and a water temperature of 8°C. The average wetted width is 1.2 m and the average depth 25.0 cm. There is no salmonid spawning potential as the bed material is 100% organics.

Lake: **CURVE**

FISHERIES MANAGEMENT COMMENTS

Netting results indicate a high density of coarse fish (northern squawfish and suckers). The trout sampled were heavily parasitized with tapeworms in the body cavity. Internal organs were attached to the body wall in an unnatural manner probably due to parasites. Low oxygen reading in water greater than 4 m in depth confines trout to the warmer upper strata increasing vulnerability to parasites. Body flesh was soft and white in sampled trout. This lake is not recommended for chemical treatment due to the extensive shallows and marsh area of the northern basin.

Complexing and the introduction of more spawning gravel in the outlet may aid in salmonid recruitment back to the lake, however, this lake appears to be at its maximum production level in terms of fish biomass.

HISTORY OF PREVIOUS SURVEYS

Lake Surveys:

No previous surveys known.

Other Related Surveys:

None known.

Lake: **CURVE**

WATER CHEMISTRY SUMMARY **Limnology Station No. 1**

Field Conditions:

Date:	June 20, 1989		
Time:	1230 hrs	Air Temperature:	16°C
Wind Velocity:	10 km/hr	Wind Direction:	SW
Cloud Cover:	5/10 O.C.	Surface Condition:	moderate ripple
Secchi Disc:	3.95 m	Water Colour:	yellowish-green

Method(s) Used:

Dissolved Oxygen:	YSI model 58 oxygen/temperature meter
Water Temperature:	YSI model 58 oxygen/temperature meter
Air Temperature:	Hand-held alcohol thermometer
pH (field):	Hach color comparitor
H2S (field):	Hach H2S field test kit
Laboratory Used:	Zenon Environmental Inc., B.C. Laboratory Services
Water Sampler:	Verticle Alpha Water Bottle (Vandorn)
Substrate Sampler:	Substrate sample not taken

Water Sample Chemistry: SEAM Site No.: Not determined.

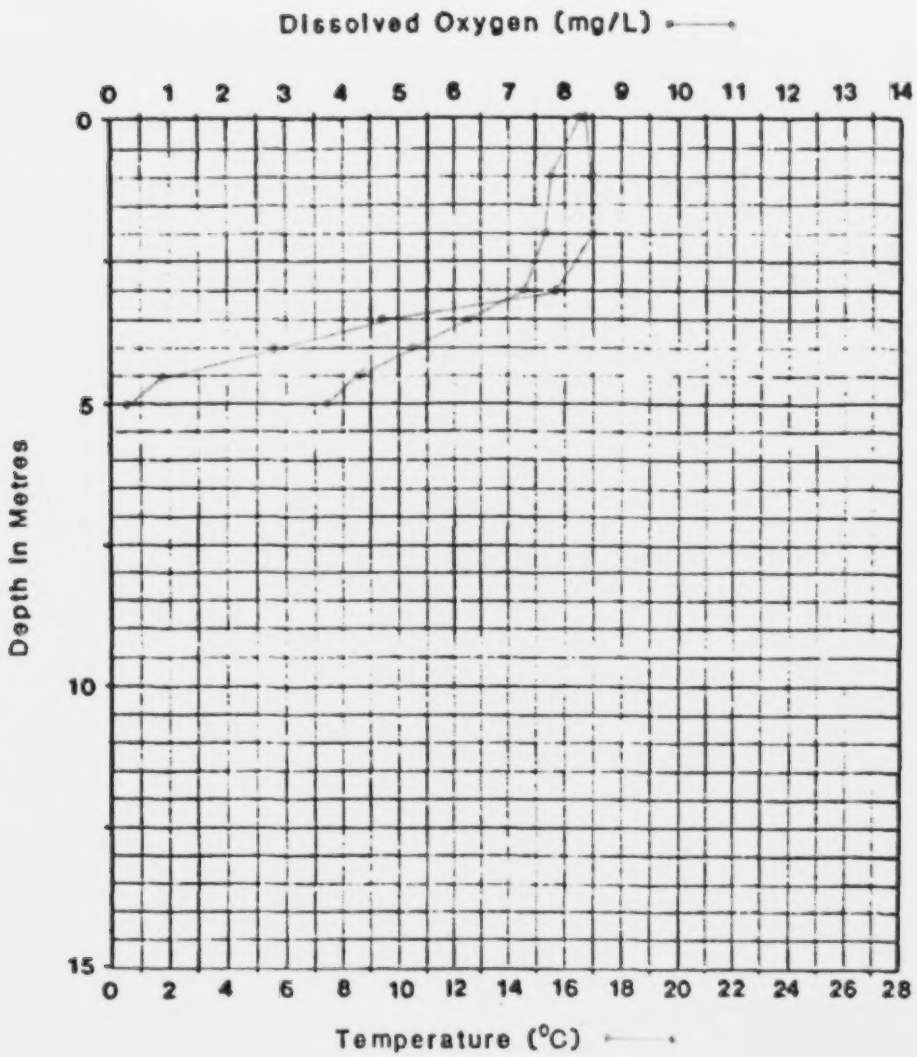
	Sampling Depths	
	Surface (0 m)	Lower (7.0 m)
pH (field)	7.3	7.0
pH (lab)	7.7	7.0
Specific Conductance (lab):	88 umhos/cm	141 umhos/cm
Filterable Residue 105°C (lab)	64 mg/l	102 mg/l
H^2S (field)	- mg/l	0 mg/l
Bottom Depth:	8.0 m	
Substrate Sample Depth:	- m	

Lake: **CURVE**

OXYGEN/TEMPERATURE DATA

Depth (m)	02 (mg/l)	Temp (C)
Surface	8.4	16.6
1.0	8.5	15.6
2.0	8.5	15.3
3.0	7.8	14.8
3.5	4.7	12.6
4.0	2.8	10.5
4.5	0.9	8.7
5.0	0.3	7.5
8.0	Bottom	

DISSOLVED OXYGEN AND TEMPERATURE PROFILE



Lake: **CURVE**

NETTING RECORD

Mesh sizes experimental order: 25,76,51,89,38,64 mm.

NETTING SITE #1

Type:	Sinking monofilament	
Date Set:	June 19, 1989	Time: 1810 hrs
Date lifted:	June 20, 1989	Time: 1045 hrs
Net Dimensions:	Length: 91.4 m	Depth: 2.4 m
Shallow End Mesh Size:	64 mm	Depth: 1.5 m
		Substrate: cobble/gravel
Deep End Mesh Size:	25 mm	Depth: 6.0 m
		Substrate: organics

Lake: **CURVE**

LAKE CATCH SUMMARY

SPECIES	NET SET NUMBER 1	2	3	ANGLED	OTHER	TOTAL	NUMBER SAMPLED	NUMBER PRESERVED	SIZE RANGE (cm)
Rainbow trout	16					16	16	--	16.0 - 31.9
Northern squaw-fish	44					44	--	--	18.0 - 22.0
Coarse sucker	47					47	--	--	18.5 - 44.0
Longnose sucker	8					8	--	--	20.1 - 38.0

MINNOW TRAPS:

BAIT: Sardines

#	HOURS	DEPTH (m)	SUBSTRATE	SPECIES	SIZE RANGE (cm)
1	16.25	0.5	Cobble	2 northern squawfish 1 redside shiner	9.1 6.7
2	16.75	0.5	sand/small gravel	1 redside shiner	4.0

Comments: A school of approximately 100 redside shiner was observed near access location.

Lake: Curve

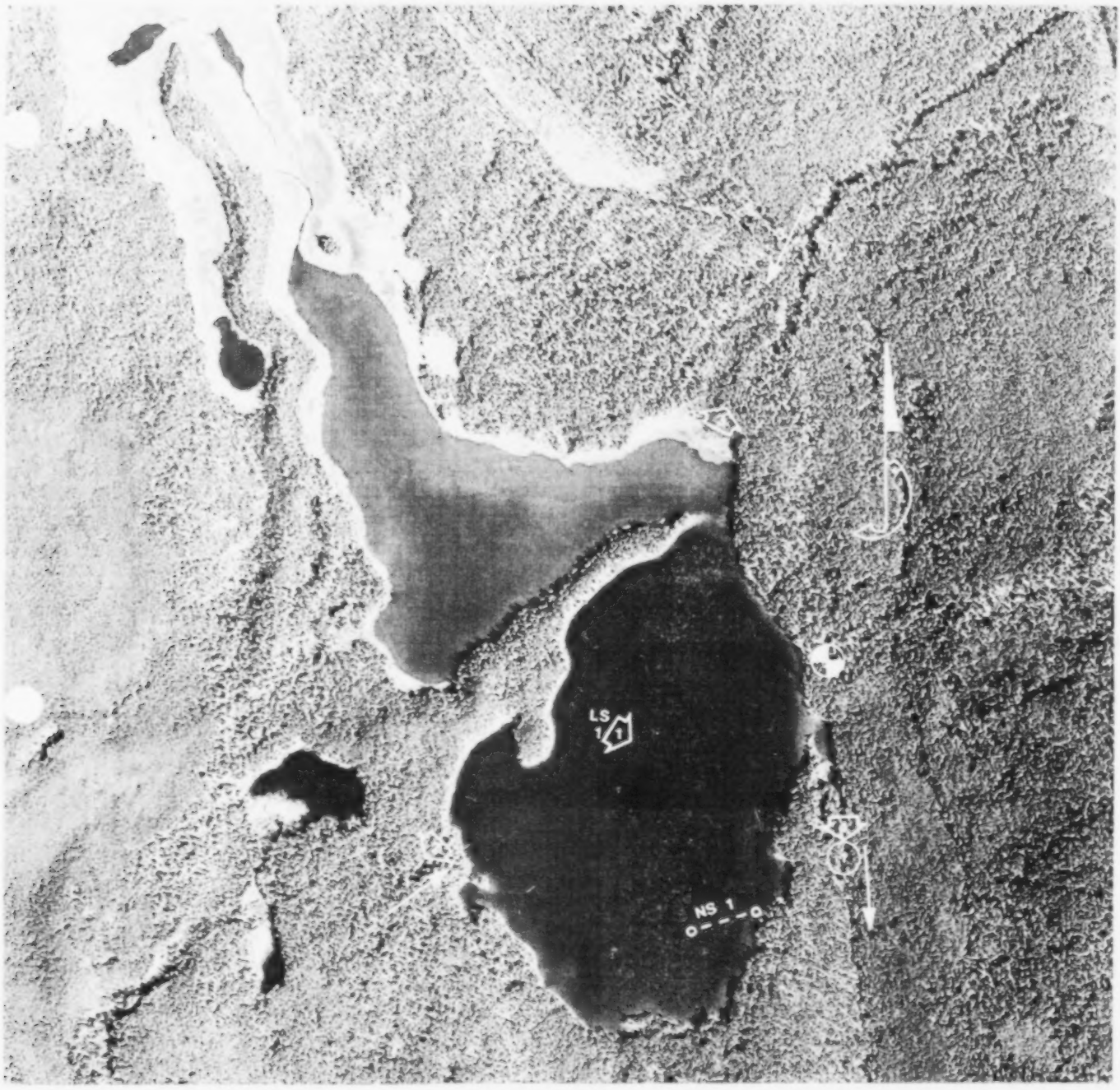
INDIVIDUAL FISH DATA

Date Captured: June 19, 20, 1989
Method of Capture: Sinking monofilament gillnet

M-Male IMM-Immature EG - Egg SC- Scale
F-Female MG-Maturing FR-Fin Ray ST-Stomach
?-Not MT-Mature " HD-Head TG-Fish Tag
Obvious GV-Gravid ML-Milt WF-Whole Fish
SP-Spent OT-Otolith
? Not Obvious

Species	Fork Length (cm)	Weight (g)	Sex	Gonadal maturity	Sample Type	Age (yr)	Stomach Contents Plankton	Insects	Fish	Other	Comments
Rainbow	16.0	50	F	MG	SC	1+	Zooplankton				
Rainbow	16.4	50	F	MG	SC	1+		Chironomids		Detritus	
Rainbow	18.2	70	F	MG	SC	1+			Unidenti-fied Fish		
Rainbow	18.4	72	F	MG	SC	1+	Zooplankton				
Rainbow	18.5	75	F	MG	SC	1+	Zooplankton				
Rainbow	21.0	110	M	IMM	SC	2+	Zooplankton				
Rainbow	28.0	228	F	MG	SC	3+		Beetle		Detritus	Tapeworms & Tapeworm Nodules
Rainbow	28.0	245	F	MG	SC	3+	Zooplankton				Tapeworms
Rainbow	28.8	22a	F	MG	SC	2+					Stomach Empty
Rainbow	28.8	265	F	MG	SC	3+					Tapeworms, Stomach empty
Rainbow	29.0	290	F	MG	SC	3+	Zooplankton				Tapeworms
Rainbow	29.6	290	F	MG	SC	3+	Zooplankton				Tapeworms
Rainbow	30.1	300	F	MG	SC	2+	Zooplankton	Chironomids		Detritus	Tapeworms
Rainbow	30.6	300	M	MG	SC	2+					Tapeworms, Stomach empty
Rainbow	31.4	355	M	MG	SC	3+		Chironomids			Tapeworms
Rainbow	31.9	370	M	MG	SC	2+					Tapeworm Cysts; Stomach empty

Comments: The rainbow were heavily parasitized in the gut and the flesh was soft and white.



1 Plate number, area, and direction

2 Point sample, number, and location

Bench mark

LS 1 Limno station location and number

O-NS 1-O Netting site location and number

1 Stream flow direction and number

Lake: **CURVE**

PHOTOGRAPH DIRECTORY

Negative #	Plate #	Description
R3: 20A, 21 A, 22A	1	Panoramic view of shoreline of southern basin looking southeast from limno station.
R3: 24A	2	View of intermittent inlet #1, 10 m upstream from lake.
R3: 25A	3	View of inlet #2, 50 m upstream from the lake. This low velocity, meandering creek has a fines substrate offering no salmonid spawning potential.
R3: 27A	4	View of outlet 75 m downstream from lake. The outlet appears to provide the majority of salmonid recruitment to the lake.

Plate 1: Panoramic view of shoreline of southern basin looking southeast from limno station.

Plate 2: View of intermittent inlet #1, 10 m upstream from the lake.

Plate 3: View of inlet #2, 50 m upstream from the lake. This low velocity, meandering creek has a fines substrate offering no salmonid spawning potential.

Plate 4: View of outlet 75 m downstream from lake. The outlet appears to provide the majority of salmonid recruitment to the lake.

Lake: CURVE

Appendix A

LABORATORY REPORT
Water Chemistry Analysis

Omineca-Peace - Fish Program ATTN: DUANE JESSON

Site: (NOSITE) CURVE LAKE

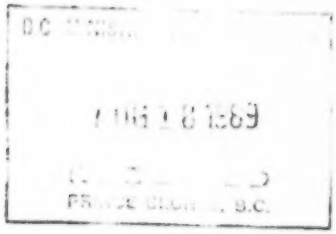
Submitted by: (000000) DUANE JESSON

Address: (07) Recreational Fisheries
Waste Management Branch
Northern Region
3rd Floor, 1011 4th Avenue
Prince George, BC V2L 3H9

Phone No. 565-6944

Audit Sample ( )
Client study reference code ( )
Sampling agency code (91)

SEAM Comments: SITE ID FORTHCOMING



Site (NOSITE) CURVE LAKE

Sample Adjective ( )
Sample State (FW) Fresh Water
Sample Descriptor ( ) Undefined

This form was processed to the computer on 22-JUN-1989 as REGULAR
The cost for analyzing samples for this form is

Routine analysis	$	112.80
Special analysis	$	0.00
Total	$	112.80

Site: NORTH CURVE LAKE

From: 89/06/20 0001 To: 89/06/20 0001
Depth Range: 0.0 - 0.0 Tide:
Sample State: Fresh Water
Sample Comment:

Parameter Description	Result	Units	Analytical Technique (Sparcode/Medium/Pres'n)
pH	7.7	pH units	Automated pH Meter (00041220/02/01)
Residue Nonfilt	2.1	mg/L	Grav. 9 cm Buchner, 105C (00081070/02/01)
Specific Conductance	88	uS/cm	Cond Meter Siebold (00111160/02/01)
Res. Filterable 1.0u	54	mg/L	Gravimetric 1.0u Filter (007H1032/02/01)
Alkalinity Total W.S	46.8	mg/L	Automated Electrometer (01021210/02/01)

Omnibus Peake Creek Program ATTN: DUANE JESSON Sample 89004322

Site: MOSITE CURVE LAKE

From: 89/06/20 0002 To: 89/06/20 0002
Depth Range: 7.0 - 7.0 Tide:
Sample State: Fresh Water
Sample Comment:

Parameter Description	Result	Units	Analytical Technique (Sparcode/Medium/Pres'n)
pH	7.0	pH units	Automated pH Meter (00041220/02/01)
Residue Nonfilt	18	mg/L	Grav. 9 cm Buchner, 105C (00081070/02/01)
Specific Conductance	141	uS/cm	Cond Meter Siebold (00111160/02/01)
Res. Filterable 1.0u	102	mg/L	Gravimetric 1.0u Filter (007M1032/02/01)
Alkalinity Total 4.5	72.5	mg/L	Automated Electrometer (01021210/02/01)

Lake: CURVE

Appendix B

TRIBUTARY STREAM DATA

Lake: **CURVE**

System Name: Unnamed C. Outlet

System No.: 20-1700-110

Site Location: Sample Site #1, 75 m downstream from lake.

Channel Width:	8.0 m	Water Temp.:	16°C
Wetted Width:	5.0 m	Stage (flow):	moderately low
Max. Depth:	16.0 cm	Velocity:	0.6 m/sec
Avg. Depth:	11.0 cm	Slope:	1.5%
Turbidity:	16.0 cm	Colour:	slightly tannic

Flood Signs (height/type):

Height: 40 cm above present water level

Type: water marks on large organic debris protruding from shore.

Bed Material: Compaction: low to moderate

fines:	15%
gravels:	80%
larges:	5%
bedrock:	0%

Banks (form, height, stability):

Right bank: undercut/0.5 m/moderate

Left bank: undercut/0.35 m/moderate

Comments:

1. 60% small gravel at site.
2. Longnose sucker juveniles in debris pool above sample site.
3. Outlet accounts for majority of salmonid spawning in this lake.
4. Rearing fair to good due to abundant cover provided by LOD (deadfall) and instream grasses.
5. Outlet flows through a series of debris jams, with the largest one at the lake.

Lake: CURVE

System Name: Unnamed C. Outlet

System No.: 20-1700-110

Site location: Sample Site #2, approximately 20 m downstream of bridge on road 35000 crossing outlet. Location not indicated on airphoto.

Channel Width:	3.5 m	WaterTemp.:	15°C
Wetted Width:	2.5 m	Stage (flow):	moderate
Max. Depth:	30.0 cm	Velocity:	0.7 m/sec
Avg. Depth:	20.0 cm	Slope:	1.0%
Turbidity:	30.0 cm	Colour:	gin clear

Bed Material: Compaction: moderate

fines:	20%
gravels:	65%
larges:	15%
bedrock:	0%

Banks (form, height, stability):

Left bank: steep/30 cm/stable

Right bank: steep/30 cm/stable

Comments:

1. Date - August 10, 1989.
2. Heavy rainfall overnight.
3. Some LOD provides instream cover.
4. 1 rainbow trout parr observed just upstream of bridge.
5. Bridge construction has resulted in barren banks allowing fines to be washed into creek. No rooted vegetation remains on right or left bank for 75 m.

Reduced to
33⅓
of Original
CURVE LAKE